Summary of some petrographic features of the Blanco Fracture Zone samples

Site A87

Twenty samples were obtained from Site A87. Fifteen samples are diabases, 3 are basalts and 2 are breccias. The diabases are aphyric to sparsely porphyritic and textures vary from intersertal to subophitic. Samples commonly possess two or more textural elements. The diabases exhibit variable hydration and replacement of the primary igneous phases. Relatively less-altered samples (3R, 4R, 5R, 8R, 9R, 14R, 15R and 20R2) are characterized by patchy replacement of pyroxene and plagioclase, which is generally chlorite-dominated. More strongly altered samples (6R, 11R, 12R, 19R and 20R1) are characterized by pervasive, nearly total replacement of pyroxene by fibrous amphibole, which has partially replaced plagioclase as well. Three other samples (13R, 21R and 22R) are intermediate in character, containing both chlorite and amphibole.

Evidence of two generations of veining is present in some of the diabases. First generation veins are typically narrow and contain green fibrous amphibole. Second generation veins are larger, more extensive and are dominated by analcite, with lesser (thomsonite?) and carbonate. Analcite has also invaded some of the first generation veins.

Chlorite-amphibole replacement in some of the less strongly altered samples takes the form of circular spots. These are well developed in A87-15R and A87-9R, and also in T783-2R1.

Semi-opaque, fine-grained material occupies angular interstitial areas in some diabases and probably represents late-stage crystallization.

Site A88

Site A88 samples consist of 7 samples of very fresh to slightly altered, porphyritic basalt with phenocrysts of plagioclase and olivine, with or without clinopyroxene. Olivine is very fresh in all samples; 4R, 5R, 6R1 and 6R2 contain a small amount of carbonate and other secondary material in vesicles.

Site A89

Site A89 samples consist of 4 porphyritic basalts, a devitrified basalt breccia and a metamorphosed gabbro(?). The basalts (1R, 2R,

5R and 6R) are variably altered and veined and contained primary phenocrysts of plagioclase, clinopyroxene and olivine. Olivine is entirely replaced in all samples. Veins are composed of fibrous amphibole, carbonate, chalcedony, analcite and other minor minerals.

The devitrified basalt breccia (7R) cotains altered, porphyritic basalt with phenocrysts of plagioclase, clinopyroxene and replaced, skeletal olivine. Extensive replacement of clasts and matrix by palagonite, analcite, carbonate and spherulitic [unknown].

Sample 8R is unique amongst the B.F.Z. samples. It is a fine- to medium-grained, foliated and recrystallized gabbro(?) containing three distinct textural zones. Relict(?), euhedral plagioclase occurs within a fine-grained mosaic of plagioclase, clinopyroxene and Fe-oxide. Late-stage veins of analcite, chlorite and [?] cut across the foliation.

Site A90

The 16 samples from Site A90 are a heterogeneous group consisting of sedimentary rocks, basalt, glassy basalt breccia, diabase and brecciated gabbro.

Amongst the sedimentary rocks, the heterolithologic breccias (4R and 6R), the volcanic arenites (13R and 19R) and perhaps the mudstone (12R), all contain constituents which could have been derived "locally" from volcanic and intrusive sources. A pebbly, granule conglomerate?(16R) contains unidentified clasts with radiolarian debris and a matrix containing planktonic foraminifera.

The two diabase samples (5R1 and 10R) have intersertal to subophitic textures and are not extensively altered, but 5R1 is brecciated.

The basalts can be subdivided into two main groups. 5R2 and 15R are weathered or slightly altered and contain phenocrysts of plagioclase, clinopyroxene and replaced olivine. In contrast, basalts 11R and 18R contain replaced olivine as the dominant phenocryst phase. Both have fine-grained, quench-textured groundmasses containing needle-like structures which may be quenched olivine. Phenocrysts in 11R are associated with chromite inclusions and, together with the quenched olivine(?) in the groundmass, may suggest a rather magnesian composition for this basalt.

The partially devitrified basalt breccias contain fresh glass with olivine(?) microlites(17R) and sparse plagioclase phenocrysts(20R). Palagonite, [unknown], analcite, carbonate, chalcedony and other minor minerals have partially replaced the fresh glass.

The brecciated gabbros (8R and9R) contain variably rounded clasts of ophitic clinopyroxene gabbro in a granulated matrix. Veining and alteration of 8R took place prior to brecciation as indicated by truncated veins of chlorite, carbonate and [unknown] within the clasts and fragmented vein quartz and [unknown] in the matrix. A similar history is recorded in sample 9R. Late stage replacement in both gabbros involved analcite.

Site A91

Site 91 samples consist of two very fresh and distinct, porphyritic basalts. 5R is highly porphyritic with abundant, large plagioclase phenocrysts and minor olivine. Chromite occurs as a minor phenocryst phase. 13R1 is is less stronly porphyritic, but contains more olivine with clinopyroxene and lacks chromite.

Site T783

Sample 1R is a highly altered and brecciated diabase. 2R1 is fresher, with minor replacement by chlorite and resembles the less-altered diabase samples in the A87 group.

Site T784

Five distinct gabbros and one basalt were collected at the T784 site. Two of the gabbros (3R and R6) are nondeformed. Sample 3R is the freshest and contains coarse, ophitic clinopyroxene and ophitic blue-green amphibole. Secondary minerals include chlorite, fibrous amphibole, epidote and [unknown]. Gabbro R6 contains diallage-textured clinopyroxene and extensive replacement of plagioclase by, chlorite, [unknown] and [unknown]. Late-stage veins in both samples contain analcite, thomsonite and chlorite.

Deformed gabbro 04 is characterized by variably rounded clasts within a granulated and partially replaced matrix. Oriented, plagioclase-rich zones in the clasts is suggestive of a cumulate origin. Quartz veinlets within the clasts and angular fragments of vein quartz within the matrix indicate that some veining and alteration took place prior to deformation.

Gabbro 2R may also be of cumulate origin. Isolated, coarse clinopyroxene-amphibole grains are enclosed within a matrix of plagioclase laths. Primary texture has been partially replaced by quartz, chalcedony, chlorite and epidote alteration.

950627 JOB NO. WF44 25 SAMPLES

REQUESTOR : DAVIS ALICE S

PROJECT : 09460-33521
BILL TO : 09460-33521

LABORATORY REPORT
U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
BRANCH OF GEOCHEMISTRY
RESTON, VIRGINIA

LAB NO.	FIELD NO.	SAMPLE DESCRIPTION
D-577414	A87-3R	BASALT
D-577415	A87-4R	BASALT
D-577416	A87-5R	BASALT
D-577417	A87-6R	DIABASE
D-577418	A87-12R	DIABASE
D-577419	A87-14R	DIABASE
D-577420	A87-15R	DIABASE
D-577421	A87-17R	BASALT
D-577422	A87-20R2	DIABASE
D-577423	A88-2R	BASALT
D-577424	A88-4R	BASALT
D-577425	A88-6R2	BASALT
D-577426	A89-5R	BASALT
D-577427	A89-6R	BASALT
D-577428	A89-8R	DIABASE
D-577429	A90-5R2	BASALT
D-577430	A90-10R	BASALT
D-577431	A90-15R	BASALT
D-577432	A90-17R	BASALT GLASS
D-577433	92 A~~91~~-5R	BASALT
D-577434	92 A~~91~~-13R1	BASALT
D-577435	T783-2R1	DIABASE
D-577436	T784-3R	GABBRO
D-577437	T784-6R	GABBRO
D-577438	T784-7RB	BASALT

PROJECT : Radiochemistry
LAB. CHIEF : G. Wandless
ANALYST : J. N. Grossman

APPROVED
Branch of Geochemistry
Reston, Virginia 22092

LAB NO.		D-577414	D-577415	D-577416	D-577417	D-577418	D-577419	D-577420	D-577421
FIELD NO.		A87-3R	A87-4R	A87-5R	A87-6R	A87-12R	A87-14R	A87-15R	A87-17R
FE	%	7.33	7.70	8.08	7.80	7.20	7.99	8.31	7.91
NA	%	2.32	2.14	2.70	2.21	2.16	2.75	2.11	1.95
BA	PPM	<40.0	<40.0	<40.0	<30.0	<40.0	<40.0	<100.	<40.0
CO	PPM	41.5	41.0	43.1	42.3	41.3	41.9	42.5	42.5
CR	PPM	342.	302.	267.	368.	379.	320.	294.	348.
CS	PPM	0.16	0.43	<0.160	<0.140	<0.150	<0.150	<0.160	<0.240
HF	PPM	2.12	2.48	2.5	2.29	2.02	2.36	2.82	2.6
RB	PPM	<5.00	<5.00	<5.00	<4.00	<6.00	<5.00	<5.00	<5.00
SB	PPM	<0.0900	<0.100	<0.100	<0.0900	<0.130	<0.100	<0.0900	<0.240
TA	PPM	0.13	0.12	0.11	0.11	0.11	0.065	0.17	0.15
TH	PPM	<0.120	<0.120	<0.250	<0.110	<0.120	<0.120	<0.120	<0.120
U	PPM	<0.250	<0.300	<0.300	<0.300	<0.240	<0.400	<0.270	<0.270
ZN	PPM	69.	65.	57.	35.	37.	61.	81.	77.
ZR	PPM	<120.	<250.	160.	<130.	<90.0	200.	130.	84.
SC	PPM	40.8	44.0	42.7	41.9	40.3	44.0	44.0	44.1
LA	PPM	2.4	2.7	2.8	2.3	2.3	2.2	3.2	3.0
CE	PPM	7.9	8.7	9.7	8.0	7.7	8.2	10.	9.9
ND	PPM	7.1	9.0	8.7	7.9	6.2	8.2	9.7	10.
SM	PPM	3.07	3.56	3.53	3.34	3.00	3.47	3.98	3.73
EU	PPM	1.08	1.20	1.25	1.16	1.03	1.20	1.36	1.29
GD	PPM	-	-	-	-	-	-	-	-
TB	PPM	0.745	0.85	0.85	0.81	0.72	0.81	0.95	0.85
TM	PPM	-	-	-	-	-	-	-	-
YB	PPM	3.02	3.37	3.4	3.28	2.84	3.28	3.82	3.50
LU	PPM	0.424	0.49	0.46	0.452	0.40	0.447	0.54	0.468
CA	%	7.7	7.4	7.0	8.2	7.6	7.0	7.8	8.0
K	%	0.48	<0.800	<0.700	<1.10	<0.500	<1.00	0.45	<0.500
AS	PPM	<0.800	1.0	<0.800	<0.800	<0.600	<0.900	<0.600	<0.600
AU	PPB	<4.00	<5.00	<6.00	<6.00	<4.00	<5.00	<4.00	<4.00
NI	PPM	87.	80.	73.	98.	90.	77.	63.	57.
SR	PPM	110.	120.	120.	95.	140.	110.	210.	130.

LAB NO.		D-577422	D-577423	D-577424	D-577425	D-577426	D-577427	D-577428	D-577429
FIELD NO.		A87-20R2	A88-2R	A88-4R	A88-6R2	A89-5R	A89-6R	A89-8R	A90-5R2
FE	%	7.38	7.63	7.55	6.54	9.74	7.78	6.80	8.84
NA	%	2.31	2.27	2.27	2.39	2.45	3.70	2.49	2.48
BA	PPM	<40.0	<150.	<40.0	<40.0	85.	<40.0	<40.0	<40.0
CO	PPM	43.2	38.9	38.2	39.2	42.4	37.2	32.6	49.3
CR	PPM	375.	227.	230.	299.	51.2	204.	154.	124.
CS	PPM	<0.220	<0.150	0.19	<0.140	<0.160	0.59	<0.160	<0.170
HF	PPM	2.1	3.02	3.03	2.68	5.16	2.8	1.2	4.89
RB	PPM	<8.00	<5.00	<14.0	<5.00	<5.00	18.	<5.00	<6.00
SB	PPM	<0.0900	<0.0900	0.21	<0.0900	0.13	<0.120	<0.110	<0.170
TA	PPM	0.087	0.17	0.12	0.075	0.28	0.17	<0.110	0.34
TH	PPM	<0.130	<0.120	<0.280	<0.120	0.20	<0.120	<0.230	0.27
U	PPM	<0.240	<0.260	<0.300	<0.250	0.18	<0.400	<0.400	0.32
ZN	PPM	54.	77.	76.	70.	130.	78.	33.	110.
ZR	PPM	<130.	120.	110.	130.	170.	<180.	<90.0	160.
SC	PPM	39.7	38.0	38.3	36.1	40.9	36.9	55.4	46.2
LA	PPM	2.2	4.0	3.9	2.7	6.56	3.6	0.81	6.1
CE	PPM	7.2	12.	12.	9.8	20.0	12.	2.6	18.8
ND	PPM	8.6	11.	11.	10.	19.	11.	4.7	18.
SM	PPM	3.03	4.15	4.17	3.75	7.48	4.06	2.02	6.67
EU	PPM	0.996	1.38	1.41	1.3	2.22	1.38	0.79	2.02
GD	PPM	-	-	-	-	-	-	-	-
TB	PPM	0.75	0.95	0.96	0.84	1.75	0.92	0.59	1.5
TM	PPM	-	-	-	-	-	-	-	-
YB	PPM	3.0	3.64	3.77	3.34	7.09	3.65	2.3	6.05
LU	PPM	0.408	0.52	0.550	0.46	0.992	0.54	0.33	0.912
CA	%	8.5	7.9	7.5	8.4	6.0	5.5	9.1	7.1
K	%	<0.400	<0.500	<0.700	<0.600	<0.900	<1.40	<1.10	<0.900
AS	PPM	<0.700	<1.00	<0.700	<0.700	<0.800	<1.60	<1.00	1.4
AU	PPB	<5.00	<4.00	<5.00	<5.00	<5.00	<6.00	<6.00	<7.00
NI	PPM	120.	99.	100.	110.	33.	52.	50.	61.
SR	PPM	110.	200.	160.	160.	130.	120.	180.	120.

LAB NO.		D-577430	D-577431	D-577432	D-577433	D-577434	D-577435	D-577436	D-577437
FIELD NO.		A90-10R	A90-15R	A90-17R	A91-5R	A91-13R1	T783-2R1	T784-3R	T784-6R
FE	%	8.21	7.92	8.97	5.93	8.72	7.11	5.74	5.60
NA	%	2.51	2.22	2.05	1.60	2.22	1.89	2.05	2.11
BA	PPM	<50.0	<40.0	<40.0	<31.0	<60.0	<40.0	<40.0	<50.0
CO	PPM	52.1	45.6	44.7	36.9	41.8	42.1	40.7	42.3
CR	PPM	160.	278.	281.	282.	76.7	390.	365.	497.
CS	PPM	<0.160	<0.600	<0.150	<0.120	0.30	<0.150	0.22	0.26
HF	PPM	4.01	2.69	3.65	1.2	3.62	1.9	0.81	0.48
RB	PPM	<5.00	<9.00	<5.00	<7.00	<16.0	<5.00	<5.00	9.5
SB	PPM	<0.110	<0.100	<0.0900	<0.0700	<0.100	<0.0900	<0.230	<0.120
TA	PPM	0.16	0.14	0.37	0.16	0.55	0.14	0.12	0.13
TH	PPM	<0.300	0.22	0.47	<0.260	0.68	0.28	0.31	0.30
U	PPM	<0.400	0.55	<0.300	<0.180	0.22	<0.300	<0.240	<0.290
ZN	PPM	110.	86.	92.	49.	87.	64.	31.	60.
ZR	PPM	190.	140.	150.	<300.	170.	93.	<80.0	<90.0
SC	PPM	45.3	46.1	40.9	28.4	41.0	41.9	29.4	45.2
LA	PPM	4.3	3.2	5.2	1.9	7.0	2.4	1.2	0.52
CE	PPM	15.	9.9	16.	5.5	17.	6.9	3.1	2.8
ND	PPM	15.	9.9	13.	5.1	13.	6.8	2.9	<2.10
SM	PPM	5.35	3.88	4.88	1.64	4.96	2.80	1.08	1.09
EU	PPM	1.69	1.32	1.58	0.69	1.59	1.1	0.61	0.55
GD	PPM	-	-	-	-	-	-	-	-
TB	PPM	1.23	0.93	1.13	0.41	1.0	0.66	0.24	0.32
TM	PPM	-	-	-	-	-	-	-	-
YB	PPM	4.83	3.87	4.48	1.8	3.82	2.8	0.98	1.2
LU	PPM	0.68	0.540	0.669	0.27	0.532	0.37	0.17	0.19
CA	%	6.7	8.4	8.3	9.0	7.7	8.6	8.0	8.3
K	%	<1.00	<0.900	<0.900	<0.260	<0.500	0.40	<0.400	<0.400
AS	PPM	1.7	<0.900	<0.800	<0.400	<0.600	<0.500	<0.500	<0.600
AU	PPB	<5.00	<7.00	<5.00	<4.00	<5.00	<4.00	<4.00	<5.00
NI	PPM	63.	75.	150.	130.	46.	120.	120.	170.
SR	PPM	130.	110.	130.	180.	170.	110.	160.	130.

LAB NO. D-577438
FIELD NO. T784-7RB

FE	%	7.18
NA	%	3.00
BA	PPM	<40.0
CO	PPM	41.1
CR	PPM	266.
CS	PPM	0.19
HF	PPM	2.8
RB	PPM	<5.00
SB	PPM	<0.110
TA	PPM	0.28
TH	PPM	0.23
U	PPM	0.50
ZN	PPM	78.
ZR	PPM	<110.
SC	PPM	38.2
LA	PPM	4.2
CE	PPM	12.
ND	PPM	9.5
SM	PPM	3.89
EU	PPM	1.29
GD	PPM	-
TB	PPM	0.89
TM	PPM	-
YB	PPM	3.48
LU	PPM	0.519
CA	%	6.9
K	%	<1.20
AS	PPM	<0.900
AU	PPB	<5.00
NI	PPM	100.
SR	PPM	240.

950809 JOB NO. WF44 25 SAMPLES

REQUESTOR : DAVIS ALICE S

PROJECT : 09460-33521
BILL TO : 09460-33521

LABORATORY REPORT
U.S. DEPT. OF THE INTERIOR
GEOLOGICAL SURVEY
BRANCH OF GEOCHEMISTRY
MENLO PARK, CALIFORNIA

LAB NO.	FIELD NO.	SAMPLE DESCRIPTION
D-577414	A87-3R	BASALT
D-577415	A87-4R	BASALT
D-577416	A87-5R	BASALT
D-577417	A87-6R	DIABASE
D-577418	A87-12R	DIABASE
D-577419	A87-14R	DIABASE
D-577420	A87-15R	DIABASE
D-577421	A87-17R	BASALT
D-577422	A87-20R2	DIABASE
D-577423	A88-2R	BASALT
D-577424	A88-4R	BASALT
D-577425	A88-6R2	BASALT
D-577426	A89-5R	BASALT
D-577427	A89-6R	BASALT
D-577428	A89-8R	DIABASE
D-577429	A90-5R2	BASALT
D-577430	A90-10R	BASALT
D-577431	A90-15R	BASALT
D-577432	A90-17R	BASALT GLASS
D-577433	92 A~~91~~-5R	BASALT
D-577434	92-A~~91~~-13R1	BASALT
D-577435	T783-2R1	DIABASE
D-577436	T784-3R	GABBRO
D-577437	T784-6R	GABBRO
D-577438	T784-7RB	BASALT

PROJECT : Rock Analysis
LAB. CHIEF : Bi-Shia W. King
ANALYST : J. Kent

APPROVED
Branch of Geochemistry
Menlo Park, California 94025

LAB NO.		D-577414	D-577415	D-577416	D-577417	D-577418	D-577419	D-577420	D-577421
FIELD NO.		A87-3R	A87-4R	A87-5R	A87-6R	A87-12R	A87-14R	A87-15R	A87-17R
NB	PPM	<10.	<10.	<10.	<10.	<10.	<10.	<10.	<10.
RB	PPM	<10.	<10.	<10.	<10.	<10.	<10.	<10.	<10.
SR	PPM	98.	87.	108.	104.	148.	112.	174.	110.
ZR	PPM	82.	92.	94.	85.	79.	93.	112.	97.
Y	PPM	23.	27.	24.	30.	28.	28.	32.	28.
BA	PPM	<30.	<30.	<30.	<30.	<30.	<30.	<30.	<30.
CE	PPM	<30.	<30.	<30.	<30.	<30.	<30.	<30.	<30.
LA	PPM	<30.	<30.	<30.	<30.	<30.	<30.	<30.	<30.
CU	PPM	97.	55.	62.	64.	30.	41.	56.	64.
NI	PPM	102.	89.	96.	88.	102.	90.	90.	88.
ZN	PPM	80.	87.	66.	25.	29.	50.	79.	96.
CR	PPM	240.	230.	225.	305.	315.	260.	215.	275.

LAB NO.		D-577422	D-577423	D-577424	D-577425	D-577426	D-577427	D-577428	D-577429
FIELD NO.		A87-20R2	A88-2R	A88-4R	A88-6R2	A89-5R	A89-6R	A89-8R	A90-5R2
NB	PPM	<10.	<10.	<10.	<10.	<10.	<10.	<10.	<10.
RB	PPM	<10.	<10.	<10.	<10.	<10.	<10.	<10.	<10.
SR	PPM	106.	152.	142.	148.	104.	93.	144.	114.
ZR	PPM	81.	134.	122.	108.	196.	110.	33.	194.
Y	PPM	24.	34.	33.	33.	65.	36.	14.	57.
BA	PPM	<30.	<30.	<30.	<30.	<30.	<30.	<30.	<30.
CE	PPM	<30.	<30.	<30.	<30.	<30.	<30.	<30.	<30.
LA	PPM	<30.	<30.	<30.	<30.	<30.	<30.	<30.	<30.
CU	PPM	55.	51.	44.	61.	39.	37.	<10.	64.
NI	PPM	136.	110.	102.	108.	51.	74.	56.	72.
ZN	PPM	42.	81.	71.	77.	138.	80.	30.	114.
CR	PPM	315.	225.	198.	270.	62.	172.	162.	106.

LAB NO.		D-577430	D-577431	D-577432	D-577433	D-577434	D-577435	D-577436	D-577437
FIELD NO.		A90-10R	A90-15R	A90-17R	A91-5R	A91-13R1	T783-2R1	T784-3R	T784-6R
NB	PPM	<10.	<10.	<10.	<10.	<10.	<10.	<10.	<10.
RB	PPM	<10.	<10.	<10.	<10.	<10.	<10.	<10.	<10.
SR	PPM	108.	98.	110.	166.	176.	110.	162.	112.
ZR	PPM	152.	96.	144.	48.	156.	74.	28.	16.
Y	PPM	40.	29.	38.	<10.	38.	24.	<10.	<10.
BA	PPM	<30.	<30.	<30.	<30.	<30.	<30.	<30.	<30.
CE	PPM	<30.	<30.	<30.	<30.	<30.	<30.	<30.	<30.
LA	PPM	<30.	<30.	<30.	<30.	<30.	<30.	<30.	<30.
CU	PPM	49.	65.	55.	55.	47.	66.	16.	72.
NI	PPM	91.	77.	152.	136.	56.	93.	144.	184.
ZN	PPM	89.	96.	99.	57.	81.	64.	21.	52.
CR	PPM	132.	194.	270.	295.	68.	285.	285.	500.

LAB NO.		D-577438
FIELD NO.		T784-7RB
NB	PPM	<10.
RB	PPM	<10.
SR	PPM	205.
ZR	PPM	114.
Y	PPM	30.
BA	PPM	<30.
CE	PPM	<30.
LA	PPM	<30.
CU	PPM	53.
NI	PPM	120.
ZN	PPM	93.
CR	PPM	215.

950427 JOB NO. WF44 25 SAMPLES

REQUESTOR : DAVIS ALICE S

PROJECT : 09460-33521
BILL TO : 09460-33521

LABORATORY REPORT
U. S. GEOLOGICAL SURVEY
OFFICE OF MINERAL RESOURCES
BRANCH OF GEOCHEMISTRY
LAKEWOOD, COLORADO

LAB NO.	FIELD NO.	SAMPLE DESCRIPTION
D-577414	A87-3R	BASALT
D-577415	A87-4R	BASALT
D-577416	A87-5R	BASALT
D-577417	A87-6R	DIABASE
D-577418	A87-12R	DIABASE
D-577419	A87-14R	DIABASE
D-577420	A87-15R	DIABASE
D-577421	A87-17R	BASALT
D-577422	A87-20R2	DIABASE
D-577423	A88-2R	BASALT
D-577424	A88-4R	BASALT
D-577425	A88-6R2	BASALT
D-577426	A89-5R	BASALT
D-577427	A89-6R	BASALT
D-577428	A89-8R	DIABASE
D-577429	A90-5R2	BASALT
D-577430	A90-10R	BASALT
D-577431	A90-15R	BASALT
D-577432	A90-17R	BASALT GLASS
D-577433	92 A~~91~~-5R	BASALT
D-577434	92 A~~91~~-13R1	BASALT
D-577435	T783-2R1	DIABASE
D-577436	T784-3R	GABBRO
D-577437	T784-6R	GABBRO
D-577438	T784-7RB	BASALT

UNCOMPLETED WORK
MPXR EDXRF Nb Rb Sr Y Zr
MPXR EDXRF Ba Ce La
MPXR EDXRF Cu Ni Zn
MPXR EDXRF Cr
RENA INAA Reston Long count

PROJECT : X-Ray Spectroscopy
LAB. CHIEF : J. S. Mee
ANALYSTS : D. F. Siems, J. S. Mee

APPROVED
Branch of Geochemistry
Lakewood, Colorado 80225

	Diabase	diabase	Basalt	diabase	diabase	diabase	diabase	basalt
LAB NO.	D-577414	D-577415	D-577416	D-577417	D-577418	D-577419	D-577420	D-577421
FIELD NO.	A87-3R	A87-4R	A87-5R	A87-6R	A87-12R	A87-14R	A87-15R	A87-17R
SIO2 %	49.7	49.4	48.9	49.7	49.4	48.7	48.1	49.4
AL2O3 %	14.8	14.4	14.2	14.5	14.6	14.5	14.8	14.5
FETO3 %	9.84 (8.85)	10.3 (9.27)	10.8 (9.72)	10.5 (9.45)	9.72 (8.75)	10.6 (9.54)	11.0 (9.90)	10.5 (9.45)
MGO %	8.29	8.29	8.05	8.02	8.33	8.00	7.87	8.10
CAO %	10.9	10.8	9.88	11.4	11.2	10.4	11.2	11.4
NA2O %	3.02	2.75	3.53	2.86	2.87	3.58	2.72	2.51
K2O %	0.15	0.06	0.13	0.09	0.15	0.14	0.34	0.04
TIO2 %	1.30	1.49	1.47	1.40	1.25	1.47	1.64	1.54
P2O5 %	0.16	0.18	0.17	0.16	0.15	0.16	0.19	0.17
MNO %	0.18	0.18	0.21	0.18	0.17	0.17	0.20	0.19
LOI 925C	1.46	1.75	2.04	0.77	1.30	2.05	1.66	1.34
Mg #	65.0	64.0	62.7	62.7	65.4	62.5	61.2	63.0

	diabase	porphyry basalt	porph. basalt	por. basalt	por. basalt	por. basalt	microgabbro crystalline	basalt
LAB NO.	D-577422	D-577423	D-577424	D-577425	D-577426	D-577427	D-577428	D-577429
FIELD NO.	A87-20R2	A88-2R	A88-4R	A88-6R2	A89-5R	A89-6R	A89-8R	A90-5R2
SIO2 %	47.0	49.8	49.8	49.3	53.2	49.0	50.4	48.6
AL2O3 %	15.7	16.1	16.0	17.3	12.7	15.7	13.4	14.1
FETO3 %	9.88 (8.89)	10.2 (9.18)	10.1 (9.09)	8.73 (7.86)	13.2 (11.88)	10.5 (9.45)	9.13 (8.22)	11.8 (10.62)
MGO %	8.67	7.21	6.72	6.23	4.67	6.10	7.43	7.16
CAO %	11.1	11.1	11.1	11.9	8.76	8.32	13.0	10.1
NA2O %	2.99	2.92	2.93	3.12	3.20	4.68	3.20	3.18
K2O %	0.15	0.19	0.30	0.07	0.15	0.55	0.09	0.18
TIO2 %	1.29	1.60	1.61	1.46	2.47	1.66	2.11	2.62
P2O5 %	0.15	0.20	0.22	0.17	0.36	0.20	0.06	0.31
MNO %	0.16	0.17	0.16	0.15	0.28	0.20	0.14	0.40
LOI 925C	2.70	0.19	0.51	0.74	0.59	2.79	0.67	1.52
Mg #	65.9	60.9	59.5	61.1	43.8	56.2	64.2	57.2

Site 1 = A87 Gorda Depression + T783 on top of N wall

LAB NO.		D-577430	D-577431	D-577432	D-577433	D-577434	D-577435	D-577436	D-577437
FIELD NO.		A90-10R	A90-15R	A90-17R	A91-5R	A91-13R1	T783-2R1	T784-3R	T784-6R
		dacite	px-basalt	hyd-dacite	px-basalt	px-basalt	hydrothermally altered dacite	gabbro	gabbro
SIO2	%	50.0	49.1	49.9	47.8	49.6	49.5	48.0	47.6
AL2O3	%	14.7	14.9	14.2	20.9	15.2	15.0	18.1	14.9
(FeO^T) FETO3	%	10.9 (9.81)	10.7 (9.63)	12.0 (10.80)	8.01 (7.21)	11.6 (10.44)	9.42 (8.48)	7.69 (6.92)	7.38 (8.64)
MGO	%	6.70	6.93	7.97	7.04	6.47	8.59	8.90	10.7
CAO	%	10.5	12.0	10.7	13.2	11.1	11.7	11.3	11.9
NA2O	%	3.19	2.87	2.67	2.10	2.87	2.46	2.66	2.74
K2O	%	0.11	0.19	0.17	0.09	0.40	0.04	0.21	0.14
TIO2	%	2.11	1.63	1.96	0.75	1.93	1.19	0.46	0.48
P2O5	%	0.24	0.20	0.24	0.11	0.27	0.14	0.09	0.06
MNO	%	0.22	0.25	0.20	0.13	0.18	0.18	0.11	0.14
LOI 925C		1.04	0.75	<0.01	<0.01	0.14	1.59	2.35	3.50
Mg #		57.5	58.8	59.4	65.9	55.2	66.8	71.9	71.1

Site 2 = A88 + A89
Site 3 = A90
Site 4 = T784

LAB NO.		D-577438
FIELD NO.		T784-7RB
		px-basalt
SIO2	%	48.9
AL2O3	%	16.0
FETO3	%	9.64 (8.67)
MGO	%	6.71
CAO	%	10.3
NA2O	%	3.79
K2O	%	0.31
TIO2	%	1.60
P2O5	%	0.21
MNO	%	0.17
LOI 925C		2.16
Mg #		60.6

Date: Wed, 26 Apr 95 11:41:45 EDT
Mime-Version: 1.0
To: randy@octopus.wr.usgs.gov
From: kelley@gl.ciw.edu (Debbie Kelley)
Subject: Letter of Intent

Hi Randy, with getting ready and moving to DC for the month, this letter got off toa slow start. I would still like to send it in either today or tomorrow with the hope that they will take it.... Let me know what you think of it and feel free to make changes as it is the first one I have written and am not sure what the format is. THanks, deb

Letter of Intent:

Crustal Accretionary and Hydrothermal Processess in the Lower Oceanic Crust: An Alvin Study of the Blanco Transform Fault Zone

Investigators:
Deborah S. Kelley, University of Washington, Seattle, WA
Randy Koski, USGS, Menlo Park, CA
Robert Embley, NOAA/PMEL, Newport OR

The Blanco Transform Fault Zone (BTFZ), extending nearly 350 km eastward from the southern terminus of the Juan de Fuca Ridge, provides a unique opportunity to examine magma-hydrothermal processes associated with the formation of intermediate spread crust. Although intensive geological and hydrographic surveys along the Juan de Fuca Ridge make this one of the most well studied ridges with respect to shallow level crustal accretionary episodes and hydrothermal processes, very little is known about the structure or nature of lower crustal plutonic rocks formed in this spreading environment. A rare and important window into these rocks, however, is provided by the BTZF, the propagation of which has created a deep incision into upper and lower crustal rocks formed at the 60 mm/yr spreading Southern Juan de Fuca Ridge. The lateral and vertical continuity of upper crustal rocks exposed along the northern scarp walls of the BTFZ have allowed direct examination of the temporal, spatial, and compositional evolution of shallow crustal accretionary events over a > 1 my history of spreading.

Results from preliminary reconnaissance dives on the eastern portion of the BTFZ show a tectonically exposed section of relatively undeformed gabbroic material that outcrops on the seafloor near the central portion of the Blanco Ridge (~44°28'N; 128°00'W; Koski et al., 1994). Due to subdued tectonic activity along the Juan de Fuca Ridge, exposure of crustal layer 3 rocks is absent along the entire 500 km length of the ridge. Therefore, the exposure of gabbroic rocks at the BTFZ offer our only direct opportunity to characterize magmatic, hydrothermal, and tectonic processes associated with formation and aging of oceanic crustal layer 3 in this intermediate spread environment. During the 1996 field season, we propose a program of 15 dives and deep-towed camera surveys along the Blanco Ridge and subadjacent northern wall of the Blanco enscarpment (BTFZ) to document the lateral and vertical extent, the structure and contact relationships, and the composition of lower crust in this area, as well as it's relationship to the upper crustal sections. In addition, to the camera tows, night operations will also include CTD surveys to investigate active hydrothermal flow within the fault zone(s) and bounding Cascadia and Gorda Depressions. Results from CTD surveys in crustally thin zones in slow-spread environments suggest that these fault zones allow enhanced circulation and reaction of fluids with lower crustal and upper mantle material leading to significant methane generation. One of the goals of the CTD surveys will be to test this hypothesis and the significance of

these processes in zones of crustal attenuation associated with intermediate-spread crust. Integration of these studies will provide the first detailed characterization of the architecture of intermediate-spread lower oceanic crust and the processes that act on it during its formation and aging.

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